

From field observations it is possible to reconstruct most of the life history. Infested wood examined in July showed only immature larvae, but wood examined in early winter and again in the early spring, showed both mature larvae and pupae. Mature larvae that pupated in the laboratory emerged after a pupal period of about 21 days. From this it is concluded that eggs laid in the early spring hatch in about two weeks, that the larvae feed for about ten months and mature in a single year. Two parasites were reared: *Cryptohelcostizus alamedensis* (Ashmead), and *Eubadizon* sp. Thanks are due Mr. C. F. W. Muesebeck and Dr. H. K. Townes, for the determination of the parasites.

Because *Psoa maculata* LeC. confines its activities to dying or dead plants, it cannot be regarded as injurious to the host plant. Ecologically, its services in reducing these plants is a useful one. It is the only beetle associated with *Baccharis pilularis* that appears to have this particular role.

A NEW BEMBIDION (CARABIDAE) OF ZOOGEOGRAPHIC INTEREST FROM THE SOUTHWEST PACIFIC

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The new *Bembidion* described below comes from a remote part of the world, from the tropical island of Morotai in the Moluccas not far northwest of the "Bird's Head" of New Guinea, but nevertheless it has a significance for coleopterists even in North America. It is an example of what is probably a very common thing: an insect from a distant country which may help toward an understanding of something in our own fauna.

The new species belongs to a group, now usually considered a subgenus of *Bembidion*, called *Cillenus* Samouelle. The group in a broad sense (including *Armatocillenus* Dupuis and *Chinocillenus* Netolitsky) is rather diverse in some ways but is characterized by a very large head, long mandibles, deep posterior transverse sulcus of pronotum, and well developed marginal elytral channels. The species of the group have been reviewed by Andrewes (Proc. Roy. Ent. Soc. London, series B, vol. 7, 190-196, 1938). Most of them, in fact all of which the habitat has

previously been known, live on the seashore, and they are usually found far below high-water mark. They are thus true inter-tidal insects, and it is this which gives them their unusual interest and special zoogeographic importance. Many of them, like many other sea-side insects, are flightless, and some of them have assumed the characteristic testaceous color of such insects. They are widely scattered over the Old World, species having been found in Europe, China, Japan, Formosa, New Guinea, Fiji, Australia, and New Zealand. They have not yet been found in the New World but the distribution of the group is probably still far from completely known.

How this group has dispersed over its wide range can only be guessed at. Most of the species must be either very salt-tolerant or able to protect themselves against salt water, so they may have dispersed partly on ocean drift. On the other hand the basic stocks of *Bembidion* are winged and can fly, and some of the winged forms have reached very remote islands, including New Zealand and the Hawaiian Islands, so the ancestor of *Cillenus* may have been winged and may have dispersed partly by flight, the wings then atrophying independently in different species in different places. It is in this connection that the present new species is significant. It is certainly a *Cillenus* within the limits set by Andrewes (*op. cit.*), but it is fully winged and (if my memory is correct) it flies, and it does not live by the sea but in gravel bars beside running fresh water. It is therefore the sort of insect from which *Cillenus* has probably been derived and which may have effected its main dispersal before the adaptation of different species to the inter-tidal zone.

This hypothesis, or guess if you prefer, fits in an interesting way into what is known of the pattern of distribution of *Bembidion* as a whole. This enormous genus occurs mostly in the north-temperate zone. There are smaller numbers of species at low altitudes in the south-temperate zone in South America and Australia, but there are very few of them in the tropics, except a few on high mountains. In New Guinea, for example, where thousands of individual Carabidae have now been collected (about 10,000 by myself), no *Bembidion* has yet been found (not even in the mountains!) except one specimen of a *Cillenus* of which the habitat is unknown. And in northern South America, inland from Santa Marta, Colombia, where I lived for more than

a year in 1928-29, the only *Bembidion* I was able to find at low altitudes belonged to the *constrictum-contractum* group of the genus and lived on salt flats, where individuals of it were common. (I found two other species of *Bembidion* at high altitudes in the Santa Marta mountains.) Generally speaking, in fully tropical lowlands everywhere in the world *Bembidion* is nearly or entirely replaced by great numbers of *Tachys*, of which different species inhabit all sorts of wet places (including salty ones), dry ground, bark of logs, and sometimes even arboreal habitats. Since *Tachys* rapidly diminishes in numbers northward and to some extent also southward in the temperate zones, its area of abundance is complementary to that of *Bembidion*. What the explanation of this is in terms of tolerances and competition I do not know.

I have found several indications, including the occurrence of *Bembidion* in northern South America as mentioned above, that the few species of the genus that do occur in the full tropics may be salt-loving or salt-tolerant forms. Whether this is the rule, and if so why, would make a fascinating study in ecological zoogeography. If it is the rule, the mere presence of *Cillenus* on tropical Morotai would suggest that the insect is salt-tolerant even though it was not found in the saline habitat, and this is just what we should expect of the ancestor of the inter-tidal species *Cillenus*.

The facts and guesses already presented, that there exists in the Moluccas a winged species which may be guessed from its occurrence in the tropics to be salt-tolerant and which is suitable to have effected the dispersal of *Cillenus* by flight and to have been the ancestor (or to be like the ancestor) from which the inter-tidal species may have been derived in different places, are perhaps sufficiently interesting to justify the publication of this short paper in the *Coleopterists' Bulletin*. But all this may have a more direct application to our fauna. We have on the west coast of North America, in California, an inter-tidal *Bembidion* (*tigrinum* LeC.) which lacks the technical characters of *Cillenus* but resembles it in appearance and way of life. In fact it is so much like *Cillenus sinicus* Andrewes of China superficially that I was astonished to find how different it is in detail. The ancestry of this species is unknown, or at least I do not know it. It may possibly be derived from the same ancestor as

Cillenus before the latter's distinguishing characters were evolved. Or it may be independently derived from a different ancestor, and in that case it is only a rather striking example of convergence. But even in that case, an understanding of *Cillenus* should help in understanding the convergent case of *Bembidion tigrinum*.

The new Moluccan species which has instigated the present paper may be called

Bembidion (Cillenus) alatum n. sp.

Rather slender, subparallel, elytra slightly depressed; greenish or aeneous black; elytra each with a sublateral blotch and a variable area near outer apical angle (sometimes including apex) more or less paler; lower surface piceous with epipleurae paler; legs including femora, palpi including penultimate segments of the maxillary ones, and antennae near the base testaceous; outer antennal segments browner; microsculpture distinct (less so in small areas near middle of head and pronotum), nearly isodiametric, slightly transverse on elytra. *Head* formed as usual in subgenus, large almost as wide as prothorax by measurement and appearing slightly wider; mandibles long; eyes moderately prominent; frontal sulci rather wide, deep straight, parallel, continued onto clypeus; antennae slender in genus, with middle segments (seen from side) about twice as long as wide; mentum almost edentate (if tooth is considered present, it is very short, wide, often irregular). *Prothorax* convex, cordate, one fifth or one fourth (by measurement) wider than long; base slightly (about one tenth) narrower than apex, more or less arcuate (variable), slightly emarginate near sides, not distinctly margined; sides vaguely crenulate posteriorly, moderately rounded anteriorly, sinuate posteriorly well before almost right, scarcely blunted posterior angles; apex truncate or nearly so, not margined; lateral margins each with a seta at basal angle and another far forward, before anterior fourth; median line fine; basal transverse sulcus deep but not distinctly crenulate, running into small basal foveae at sides. *Elytra* one fourth or less wider than prothorax, rather long, subparallel, subdepressed, with normally prominent humeri; basal margin joining bases of fifth striae (same on both sides in all specimens), at most weakly subangulate at humeri; sides with a small but rather abrupt sinuate

emargination before apex in both sexes; striae entire, rather deep, fifth and eighth deeper at apex; intervals moderately convex, eighth narrower and more convex, third 2-punctate (punctures near or slightly before middle and behind apical fourth). Inner wings fully developed. Prosternal process lightly longitudinally impressed; metasternal process not margined; metepisterna long, very narrow posteriorly; posterior trochanters about one half length of femora, only bluntly pointed, not produced in male. Male with first two segments of each front tarsus slightly dilated, with squammules below. Length about 4.0 (only slight variation); width about 1.4 mm.

Holotype (M. C. Z. Type No. 29,020) and 11 paratypes all from the southern lowlands of Morotai Island, Moluccas, September, 1944, taken by myself by throwing water over gravel bars in a clear, flowing stream. I think the beetles flew actively, but perhaps my memory is not to be trusted on this point.

This new form is evidently related to *Bembidion (Cillenus) albertisi* Putzeys, which is known only from the unique type from Sorong, New Guinea. I have not seen the specimen, but it has been redescribed by Andrewes (*op. Cit.* p. 192). Whether or not *albertisi* is fully winged is not stated. Careful comparison of my specimens with Andrewes' description of other characters reveals several differences of which the most important may be that, in *albertisi*, the basal margin of the elytron reaches the fourth stria, while in my series it reaches only the fifth, but this difference could be an individual one or a mistake by Andrewes. A less important but more certain difference is that in *albertisi* the penultimate segment of the maxillary palpi, and also apparently the femora, are dark, while in my specimens they are pale. My specimens apparently differ from *albertisi* also in having the basal transverse sulcus of the pronotum not distinctly crenulate (but the difference may not be very great), and there are apparently other small differences hardly worth mentioning and certainly not worth emphasizing. I am reasonably sure that the new form is different from *albertisi*, but I am not so sure whether it should stand as a full species or as a geographical subspecies. Time and more material will tell, and in the meantime the Moluccan form, because of its ecological and zoogeographical interest, should be made known and should have a name.